# AI-big data analytics for building automation and management systems: a survey, actual challenges and future perspectives

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## Abstract

In theory, building automation and management systems (BAMSs) can provide all the components and functionalities required for analyzing and operating buildings. However, in reality, these systems can only ensure the control of heating ventilation and air conditioning system systems. Therefore, many other tasks are left to the operator, e.g. evaluating buildings' performance, detecting abnormal energy consumption, identifying the changes needed to improve efficiency, ensuring the security and privacy of end-users, etc. To that end, there has been a movement for developing artificial intelligence (AI) big data analytic tools as they offer various new and tailor-made solutions that are incredibly appropriate for practical buildings' management. Typically, they can help the operator in (i) analyzing the tons of connected equipment data; and; (ii) making intelligent, efficient, and on-time decisions to improve the buildings' performance. This paper presents a comprehensive systematic survey on using AI-big data analytics in BAMSs. It covers various AI-based tasks, e.g. load forecasting, water management, indoor environmental quality monitoring, occupancy detection, etc. The first part of this paper adopts a well-designed taxonomy to overview existing frameworks. A comprehensive review is conducted about different aspects, including the learning process, building environment, computing platforms, and application scenario. Moving on, a critical discussion is performed to identify current challenges. The second part aims at providing the reader with insights into the real-world application of AI-big data analytics. Thus, three case studies that demonstrate the use of AI-big data analytics in BAMSs are presented, focusing on energy anomaly detection in residential and office buildings and energy and performance optimization in sports facilities. Lastly, future directions and valuable recommendations are identified to improve the performance and reliability of BAMSs in intelligent buildings.